REMARKS

Claims 1-14 were pending. Claims 3, 4, 10 and 14 have been amended with Markush-type language solely in order to conform them more closely to U.S. practice. Support for the amendments to the claims can be found throughout the specification and claims as originally filed.

No new matter has been added. Applicants reserve the right to pursue the claims as originally filed in one or more separate applications.

Allowable Subject Matter

As a preliminary matter, Applicants thank the Examiner for her indication that claims 11-12 would be allowable if rewritten in independent form.

Claim Rejections - 35 U.S.C. §112

Claims 4 and 7 have been rejected under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which is regarded as the invention.

Specifically, the Examiner has indicated that claim 4 is "rejected because it is unclear what the choices are because of the use of 'or' and 'and'." Applicants respectfully submit that claim 4 has been amended to read:

> The proton conductive solid polymer electrolyte according to claim 1, wherein said material is at least one material selected from the group consisting of compounds having at least one nitrogen-containing heterocyclic compound group, compounds having at least one amino group, compounds having at least one imino group and nitrogen-containing heterocyclic compounds.

The Examiner has also indicated that claim 7 is "rejected because it is unclear how it further limits claim 3." It appears that clarification of the term "polybenzimidazole" is needed. Applicants submit that polybenzimidazole is a term used in the art to denote a polymer which incorporates benzimidazole or derivatives thereof into the backbone. Applicants further submit

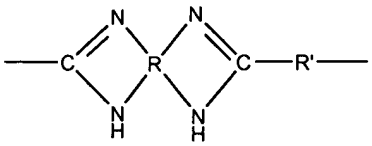
that the Examiner is correct in her assertion that the term "polybenzimidazole" is inclusive of amine monomers (1), (2) and (3) of claim 3, but not amine monomer (4).

In light of the foregoing comments, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. §112, second paragraph, and reconsideration of claims 4 and 7.

Claim Rejections - 35 U.S.C. §102(b) and §103(a)

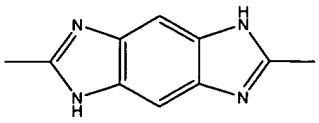
Claims 1-4, 6-10 and 13-14 have been rejected under 35 U.S.C. §102(b) as being anticipated by or, in the alternative under §103(a) as being obvious over Brinegar (U.S. Patent No. 3,841,492). Applicants respectfully submit that Brinegar does not teach or suggest a ***solid polymer electrolyte*** comprising a material which has at least one lone pair dispersed within a base material ***where the mole number of said material per gram of base material is less than 0.0014 mol*** as provided by independent claim 1.

Brinegar, at best, teaches a process for producing a membrane which includes providing a ***solution*** of a polymer consisting essentially of units of the following structure:



where R is a tetravalent aromatic nucleus and R' is, for example pyridine or pyrazine, in a solvent capable of dissolving the polymer. Brinegar does not provide a ***solid polymer electrolyte*** with a basic solid polymer as a base material, said material being impregnated with an acidic inorganic liquid as provided by presently pending claim 1, at least because Brinegar provides a <u>solution</u>, which is subsequently evaporated and <u>washed</u> *"to remove residual solvent..."* (emphasis added, see, *e.g.*, column 4, lines 58-67). That is, Brinegar teaches removing the liquid (*e.g.*, DMSO) from the membrane.

Furthermore, Brinegar does not teach or suggest a composition or methods for making a composition "where the ***mole number of said material per gram of base material is less than 0.0014 mol***" at least because R' in Brinegar is *always present in each structural unit* of the



polymer which forms a membrane. That is, for example, using ("monomer" = 158.1 g/mole), as a representative of the left portion of Brinegar's structure, R' would be present in an amount of 0.0063 moles per gram of base material. That is,

$$\frac{1mol\cdots R'}{1mol\cdots monomer} \equiv \frac{1mol\cdots R'}{158g\cdots monomer} \equiv 0.0063 moles\cdots R'/gram\cdots monomer$$

Because of this 1:1 ratio of "monomer" to R' required by Brinegar's structure, it would be impossible to modify it to obtain the presently claimed polymer solid electrolyte.

Accordingly, Applicants submit that Brinegar does not teach or suggest a polymer solid electrolyte as provided by independent claim 1. Withdrawal of the rejection of claim 1, and claims 2-4, 6-10 and 13-14 dependent therefrom, under 35 U.S.C. §102(b) or in the alternative under §103(a) and reconsideration of the claims is respectfully requested.

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Claims 1-9, and 13-14 have also been rejected under 35 U.S.C. §102(b) as being anticipated by or, in the alternative under §103(a) as being obvious over Schecter *et al.* ("Imidazole and 1-methyl imidazole in phosphoric acid doped polybenzimidazole electrolyte for fuel cells."). Applicants respectfully submit that Schecter does not teach or suggest "a ***proton conductive*** solid polymer electrolyte comprising ... a material which has at least one lone pair dispersed within a base material ***where the mole number of said material per gram of base material is less than 0.0014 mol***" as required by independent claim 1.

Schecter, at best, teaches PBI/H_3PO_4 membranes (6:1 molar ratio of acid:monomer) that include *10%, 30% and 60% imidazolium salt*. Presuming that the weight of one monomer unit of polybenzimidazole is approximately equal to the weight of benzimidazole (118.1 g/mole), Schecter's membranes include approximately 0.051 moles of acid per gram of monomer. That is

$$\frac{6mol\cdots acid}{1mol\cdots monomer} \equiv \frac{6mol\cdots acid}{118.1g\cdots monomer} \equiv 0.051 moles\cdots acid/gram\cdots monomer$$

Additionally, the ***least*** amount of imidazolium salt in any Schecter example is 10% (a 10:1 molar ratio of acid:salt). Accordingly, the lowest amount of imidazolium salt present in the membranes disclosed in Schecter is *0.0051 moles per gram of monomer.* In contrast, the claimed invention requires that the material which has at least one lone pair be present in an amount of ***less than 0.0014 mol per gram of base material*** (*e.g.*, monomer). Schecter does not teach or suggest such compositions. In fact, Schecter ***teaches away*** from the present invention at page 186, column 2, where it specifically states that "[a]dding imidazolium salts to PBI/H_3PO_4 membranes *does not improve the conductivity* of the membranes..." (emphasis added).

Accordingly, Applicants submit that Schecter does not teach or suggest a polymer solid electrolyte as provided by independent claim 1. Withdrawal of the rejection of claim 1, and claims 2-9 and 13-14 dependent therefrom, under 35 U.S.C. §102(b) or in the alternative under §103(a) and reconsideration of the claims is respectfully requested.

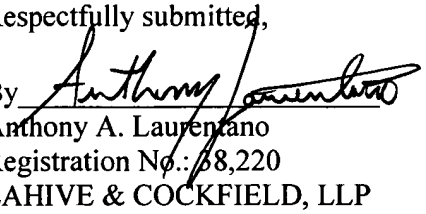
CONCLUSION

In view of the above amendment, Applicants believe the pending application is in condition for allowance.

Applicants believe that no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 12-0080, under Order No. TOW-032 from which the undersigned is authorized to draw.

Dated: September 7, 2006

Respectfully submitted,

By 

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AMENDMENTS TO THE DRAWINGS

In Figure 3, please replace the unit "(S/m)" with the unit "(S/cm)."

Support for this amendment can be found at least in the specification at page 17, line 25, where it indicates that proton conductivity carries units of S/cm. The skilled artisan would understand that the proper unit for proton conductivity in this application is S/cm, and that "S/m" is merely a typographical error.

A replacement drawing sheet is provided herewith in accordance with 37 C.F.R. §1.84